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ABSTRACT

This report, the third of a series of reports dealing with convergent communication among children, compares children's performance on certain communication tasks with that of adults. (Convergent communication is defined as communication in which two persons cooperatively exchange information in order to reach an explicitly stated goal and where, because neither person has sufficient information to solve the problem alone, cooperation and a convergence of information is necessary to reach a solution.) The communications of 48 child dyads and 25 adult dyads, which were observed during the performance of three convergent communication tasks were compared on various features of communication structure and content. Compared to child dyads, adult dyads more consistently marked the organization of the communication and included more evidence of verbal cooperation and reclarification of encoded messages. Children's communications showed more variability in the inclusion of the identified structural features than did adult dyads. No differences in these features were observed in the communication of children from different socioeconomic, race, and sex subgroups. (Author/FWB)

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THE JOHNS HOPKINS UNIVERSITY

REPORT No. 94

CENTER FOR THE STUDY OF SOCIAL ORGANIZATION OF SCHOOLS

STUDIES IN CONVERGENT COMMUNICATION:

III. COMPARISONS OF CHILD AND ADULT PERFORMANCE

AL 002 735

CATHERINE GARVEY

AND

THELMA BALDWIN

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Abstract

The communications of 48 child dyads and 24 adult dyads, which were observed during the performance of three convergent communication tasks, were compared on various features of communication structure and content. Compared to child dyads, adult dyads more consistently marked the organization of the communication and included more evidence of verbal cooperation and reclarification of encoded messages. Children's communications showed more variability in the inclusion of the identified structural features than did adult dyads. No differences in these features were observed in the communication of children from different SES, race and sex subgroups.

Preface

This paper is the third of a series of three reports on a project of the Language and Communication Program. The purpose of the project is to study how children exchange information in problem-solving situations. Two principal areas of research are (1) the study of the speech behavior in these communication situations and (2) the search for determinants of accuracy in carrying out the problem-solving tasks. Underlying both areas of research is the attempt to delimit a type of communication situation which (1) would show consistent linguistic and interactional characteristics and (2) would serve as a framework in which behaviors and factors contributing to accurate solutions could be identified. Accordingly, three tasks representing the defined type of communication were developed and were administered to children and to adults.

The first report dealt with the problems of describing the linguistic behavior in the communications and includes a coding manual developed for use in subsequent studies. Evidence of interjudge agreement in the use of the coding system was also presented. The second report described the tasks designed to elicit problem-solving behavior and reported on their adequacy as a measure of communication accuracy and identified components of accurate communications. The role of speaker characteristics in the prediction of communication accuracy was also examined. The third report presents further comparisons of child and adult communications, including structural characteristics of the communications as well as features of strategy related to the principal performance measures.

Introduction

This study represents exploratory work in a relatively new area of developmental sociolinguistics. An important programmatic paper by Hymes (in press) urges research on the development of communicative competence, on the manner in which competence in the use of language is acquired. In addition to acquiring the grammar and semantic system of their language, children learn to distinguish varieties of speech which are associated with culturally significant differences in speaker-addressee status and relationship, with topic of conversation, with the setting of speech and with the purpose of the verbal interaction. Little is known about how or when these intricate and interlocking sociolinguistic rule systems are acquired by children although some recent work suggests that some differentiation of speech according to use occurs in the first few years of life (Weeks, 1970). Evidence of understanding functional sequencing rules by speaker roles has also been observed in young children (Sacks, 1966).

Although not a great deal is known about the rules which underlie the complex systems of language use in adults, some indication of the nature of these rules has been provided by Schegloff (1968) in a study of summons-answer routines; by Churchill (1970) in a study of question-answer behavior; and by Labov, et al. (1968) in a description of the highly structured speech events of nonstandard Negro English called sounds. McGuire and Lorch (1968) have proposed that different collocations of rules may underlie different modes of conversational interaction (e.g., interrogation, problem-solving).

In the present study we have restricted the variety of language use to one functionally defined type of communication and have attempted to describe the structural features that characterize adult speech in that

mode of conversation (Garvey & Baldwin, 1970). We have then attempted to compare children's performance to that of adults on several dimensions that reflect the organization of the communication. The children studied were fifth graders, that is, they were relatively mature speakers of their own first language and could be presumed to have also acquired some experience with functionally differentiated varieties of their language.

Although this comparison of fifth-grade children and adults does not constitute a developmental study of communicative competence, it is intended as a first step toward understanding how children differ from adult speakers in performing a commonly occurring and, we suggest, internally structured type of communication.

In two previous reports, a type of problem-solving, or convergent communication, was defined as a communication in which two persons cooperatively exchange information in order to reach an explicitly stated goal. It was further specified that the two persons together have sufficient information to solve a given problem, but neither person is able to solve it alone. Therefore cooperation and a convergence of information is necessary in order to reach a solution. The common functional characteristics of this type of communication are related to structural features of the communications which conform to the definition (Garvey & Baldwin, 1970).

Three communication tasks were developed in order to elicit convergent communication. Although the content of these communication tasks differs considerably, all include the characteristics which define convergent communication. In all of the tasks instructions were used to explicitly state a goal which two persons could achieve by cooperatively exchanging the information they each possess. A visual barrier was placed

between the two persons so that all communication was verbal. In the first task one person is given an array of pictures of imaginary creatures and the other person is given a single picture which is the same as one of the pictures in the array. The goal of the communication is the identification of the one picture in the array which matches the single picture. In the second task one person is given a constructed molecular model; the other is given a box of balls, sticks and springs. The goal of the communication in this task is the construction of a three dimensional matching molecular model. In the third task both persons are given copies of a map; one has a route drawn on the map, the other does not. The goal of this task is to draw the route on the blank map.

Another characteristic these tasks have in common and which we posit as a further characteristic of convergent communication is a distinction between the functions of the two participants. One function is that of a Knower, who is cognizant of the final form of the solution (e.g., the correct picture, the constructed model or the correct route). The other function is that of a Doer, who is aware of the problems which emerge in the course of the interaction and has the responsibility of executing the solution (e.g., choosing the picture, building the model or drawing the map).

Dyads of adults and dyads of children were observed solving ten of the picture identification tasks, four model building tasks and two map tracing tasks. Dyad members alternated in the Doer and Knower functions. All tasks were scored for accuracy, and the entire verbal interaction was analyzed in a sample of the tasks.

Although all three tasks require a cooperative exchange of information, the nature of the information and the way it is distributed between

the two participants in each task results in different strategies for seeking and presenting information.

In the picture identification task (Task I) the information which is needed to reach a correct solution consists, specifically, of four dimensions, each having dichotomous attributes. The presence of these attributes in the imaginary creatures distinguishes the correct from the incorrect creatures in the array. Dyads used a variety of strategies in order to identify and exchange information about the dimensions and their attributes. An efficient approach consisted of the Doer, who could see the entire array, asking the Knower disjunctive questions about the attributes (e.g., "Does the bug have red or black dots?"). The Knower, then, was able to present all of the necessary information by offering short, appropriate answers. Another, less efficient, strategy consisted of the Knower describing his single figure in elaborate detail, including more than enough information for the Doer to use in identifying the correct figure in the array. In practice a mixture of both of these strategies was often used. Either could lead to a correct solution, but dyads in which the Doer took the more active role in identifying the critical information tended to complete the tasks with fewer words.

The information to be exchanged in the model building task (Task II) concerns the configuration of a specific number of different colored balls and various connecting sticks and springs. The usual approach in this task was for the Knower to instruct the Doer by describing his model, part by part, as the Doer assembled the pieces. The Doer sometimes asked questions in order to confirm his construction but unlike the first task, the Doer could not readily get the relevant information by asking disjunctive questions. The second version of the task, in which the

Doer is given part of the model already constructed, requires a more elaborate orientation component than the other tasks. Successful dyads typically began these tasks with a phase in which the Doer presented information about his already constructed piece of the model to the Knower. Then, after the Knower acknowledged understanding of the Doer's partial model, he began presenting information and the Doer began building.

In the map tracing task (Task III), the Knower and Doer both receive copies of the same map. In addition to this shared information, the Knower also sees the complete route which is to be drawn on the Doer's map. In this task, if the Knower were particularly skilled in presenting information, it would be possible for the Doer to execute a correct solution without saying a word. In practice, however, the Doer did speak, often simply acknowledging the receipt of information and occasionally asking for more information, or for clarification of a previously given direction or for review of some completed corners.

Despite these differences in the requirements the tasks place on the two participants, there is evidence which supports the contention that these tasks do represent a type of communication which requires or elicits similar behaviors from the participants. As described in the second report (Baldwin & Garvey, 1970), children's accuracy scores on the three tasks showed considerable consistency (KR 20 = .72). Moreover, behaviors (e.g., orientation to another's situation and communication of essential information) which were observed in one task could be used to predict accuracy in all three tasks. Since adults could perform the communication tasks easily, their tasks were nearly all completely correct, and there was very little variance in the accuracy scores.

Therefore, it was not possible to use the approach of examining common variance in accuracy scores to demonstrate consistent performance in the adult communications. Evidence of structural consistency in adult speech and in other aspects of performance such as communication strategy, however, is available and will be presented in detail in this report.

In general, the procedure will be to isolate a structural feature of the communications and to compare the performance of child dyads to that of adult dyads on that feature. Features used for the comparison range from those relating to the structure of the total communication to features which characterize the content of single utterances. In presenting the results, not only the mean frequency with which those features occur, but also the variability around those group means will be used to contrast child and adult performance.

The Stages of Convergent Communication

A total communication is differentiated into three stages. The orientation stage, the task conduct stage and the closing stage are steps in the progress of the goal-oriented interaction. In the communications elicited by the tasks, the function of the orientation stage is subsumed, in part, by the instructions, which state the nature and objective of the task. Also, the closing stage is, in part, affected by the constraints of the experimental situation. The participants must signal the conclusion of the task not only to each other but also to the experimenter. It would be expected, too, that the repetition of a task in several subtasks

would have the effect of truncating these stages whose function is to establish procedures and conclude the interaction respectively. In spite of these constraints placed on the communications by the experimental situation, vestiges of the orientation and closing stages are frequently present and can be distinguished from the task conduct stage.

The orientation stage will be considered present if one or more of the opening events refer to task management (e.g., "I'll ask the questions this time") and/or to a task constant. The task constant may be the goal (e.g., A - Okay we're going to go from the school to the ball park. B - The school on the lower left-hand corner? A - Yeah), or the task manipulanda (e.g., A - What we've got here is a bug. B - Yeah, a beetle), or both (e.g., A - Okay, now my figure looks like a poodle without a head. B - Right, I'm going to give you the head).

The closing stage is considered present if there is reference to task conclusion <u>after</u> the operations have been completed: after attributes have been identified (Task I); after the model has been built (Task II); or after the last point on the map has been reached (Task III). An example of the closing stage from Task I is: A - Okay, have you got it? B - Yeah, this one; from Task II: A - I have the figure, man, if there's no more. B - All right, just as long as you have it over the top. A - Yeah. B - Okay; and from Task III: A - So now you're at the ball park. B - Yeah, so that's it? A - That's it. Also included in the count of representations of the closing stage were terminal review or summary statements occurring after the completion of the task operations.

The percentages of adult and child dyads for whom the orientation (O) and closing (C) stages were present are given in Table 1.

TABLE 1

Percentage of Dyads with Representation of Orientation Stage (O) and Closing Stage (C) in Three Tasks

Task	Child[a]	Adult (N=24)
Task I (4 subtasks)	O 77% C 96	O 92% C 100
Task II (2 subtasks)	O 64 C 89	O 92 C 100
Task III (2 subtasks)	O 55 C 89	O 79 C 88

[a]Missing data reduced the child dyads to N=47, N=44 and N=44 for the three tasks, respectively.

In all three tasks, a greater percentage of adult dyads perform the orientation and closing stages than do child dyads ($z > 1.67$, $p < .05$ for all comparisons except closing in Task I where $p < .10$ and in Task III, n.s.) The fifth-grade child dyads have, however, a fairly high representation of these stages in their speech. The fact that adult dyads use a smaller percentage of the two stages in Task III than in the other two tasks may be in part a result of increased familiarity with the speech situation, and in part a result of intrinsic task differences. Since all tasks were presented in the same order, this question cannot be resolved.

Chunks in Convergent Communication

The stages of the communication are composed of units of content called chunks. The chunk reflects a single major theme, which may be

proposed by either participant and on which both members of the dyad focus their attention. Thus the number of chunks in a subtask reflects the steps distinguished by the dyad in the process of carrying cut that subtask. The number of chunks is not determined solely by the task content (e.g., by the number of attributes and dimensions, or by the number of sticks, balls or connections to be made), but by the dyad's analysis of the task into its components. The number of chunks in a subtask may differ across dyads. Thus in moving from the beginning point of the map (Task III) to a given point four corners or turns from the beginning point, one dyad may distinguish four chunks, another three, five, or more.

In this section we will discuss the differences in the number and size of chunks observed in the performances of child and adult dyads. However, it will be useful, first, to review the identifying features of these thematic units. We will assume that the characteristics which may be utilized by an observer to delimit chunks are also salient for the participants of the interaction. We have not, however, attempted to assess the relative importance of any single characteristic in the identification of those units.

In the examples below, the boundary points between chunks are marked by a double slash (//).

Task II (Adult)	Doer	Knower
20)	so that the flat surface is facing to the right?# unh that means I have unh--a hole facing right at me#	
21)		yeah and one more that's facing out the back#
22)	okay/ //	

23) okay--now in these two holes put springs--a spring in each one#

24) a spring in each one of these two holes?#

25) unh huh#

26) okay# yeah# //

27) and now you want to connect a red ball on top# but put the flat surface facing more or less towards you#

28) unh--the red ball to the springs?#

29) yes#

30) unh--which flat surface faces me?# the one--the spring that's closest to me?#

31) yeah#

32) that flat surface should be pointing toward me how about the other one?#

33) well connect the other spring into the other hole/

34) oh# and the flat surface should be facing me?#

35) unh huh#

36) okay I got it# //

37) okay now out of the hole like--setting up your equator --the north--opposite the flat section#

38) okay the same black ball?/

39) yeah place the short stick#

40) okay#

41) and attach to this a red one so that the flat surface is facing up#

42) all right# //

43) and then--exactly opposite the flat surface you should have another--hole?#

At the end of events 22, 26, 36 and 42, a chunk boundary occurs. The boundary follows a point of low density of new information in which some type of checking or evaluation of transmitted information occurs, e.g., events 24-25-26. After the boundary point, a marker or signal of new chunk beginning occurs, e.g., okay, now, and then. In events immediately

following these signals, a new theme is introduced, e.g., the theme of the chunk comprised of events 37-42 can be paraphrased as "putting a short stick in a black ball and attaching a red ball to the stick."

Another example, from Task III, shows similar structure:

Task III	Doer	Knower
		1) all right--now right above the school--you see the curved line?#
	2) okay#	
		3) taking like--the extreme left line and bringing it down to the curve?#
	4) unh--the line that's straight unh the left side?#	
		5) yeah#
	6) sort of curves in and then out?#	
		7) yeah#
	8) okay# //	
		9) all right go up to the first intersection the first point--where it becomes straight?#
	10) okay we're up to the first intersection?#	
		11) yeah#
	12) okay# //	
		13) it's you're gonna take a right --the road that runs right under the--underneath the truck#
	14) turn right?#	
		15) turn right#

Events 1 and 9 are marked as first events in chunks. Chunks begin with a signal (e.g., all right) and a new theme is immediately introduced. Events 8 and 12 terminate chunks. Low density of new information and checking or evaluation characterize the events preceding the boundary points.

We will return to the description of the internal characteristics of chunks in a subsequent section. The question to be examined here

is whether children and adults differ in the number of chunks used to complete a task.

Task I was examined first since the comparatively shorter subtasks and the more clearly specified information required for a correct solution provided the best basis for examining the way in which children and adults chunked their communications. The mean number of chunks used by dyads in the coded Task I subtasks was computed. The means and standard deviations of the child and adult mean number of chunks are shown in Table 2. Neither the means nor the variances of the child and adult distributions were significantly different.

TABLE 2

Means and Standard Deviations of Number of Chunks per Subtask in Task I for Child and Adult Dyads

	Child (N=47)	Adult (N=24)	Significance of Child-Adult Difference
M	6.10	5.87	n.s.
SD	2.66	2.11	n.s.

Thus in carrying out Task I child and adult dyads used approximately the same number of chunks. It is important to note, however, that this count does not necessarily indicate that both groups divided the task into qualitatively similar units of content. The count includes orientation and closing chunks, if any were present, and chunks devoted to repetition or review as well as chunks devoted to the identification of the critical attributes. Since adults were more accurate in their choices

than children, a further analysis was performed in order to determine whether adults mentioned a greater number of critical attributes than children. The average number of attributes mentioned across the four subtasks was determined for each dyad. A t test performed on this data was significant at the .001 level, with adults mentioning more attributes. Adults do not differ from children in the number of chunks required to make a decision, however, examination of the transcripts suggests that children devote a greater number of their chunks to less critical material or to repetitions of themes already discussed.

Since the sample of coded subtasks from Task II included a standard number of exchanges rather than a standard portion of the task, it was not suitable for making a comparison between the number of chunks used by adult and child dyads. The coded sample from Task III, however, included all exchanges from the beginning of the task to a point nine corners (or eight turning points) from the starting point, so an adult-child comparison in number of chunks was possible. Table 3 presents the means and standard deviations of the distributions of the number of chunks performed by child and adult dyads. An F ratio comparing the variances of the two distributions was significant ($p < .02$) indicating that the adult dyads were more consistent, or more similar to one another, in the number of chunks used than were the child dyads.

The procedure recommended by Hayes (1963) was used to test the differences between the means which are based on samples of unequal size and nonhomogeneous variances. The results of this analysis were also significant ($t = 3.063$, $p < .02$); adults tended to use more chunks than children to complete the same portion of the map.

TABLE 3

Means and Standard Deviations of Number of Chunks in Task III for Child and Adult Dyads

	Child (N=47)	Adult (N=24)	Significance of Child-Adult Difference
M	6.51	8.96	$p < .02$
SD	4.32	2.31	$p < .02$

We cannot state from these data whether children underspecify the number of turns or corners or that they compress more information into a chunk. We can only point to the greater consistency in the number of chunks used by adults to complete a standard portion of the task.

A further analysis of chunking behavior was undertaken to ascertain whether child and adult dyads differed in respect to the length of chunks (number of events). Transcripts of adult communications give the impression that chunks are longer and internally more diversified and show less fluctuation in length than do children's chunks. A random sample of five chunks per dyad was taken for each of the three tasks. The number of events for each chunk was counted. The results of this analysis are presented in Table 4.

In two of the tasks child dyads exhibit significantly greater variance in the size of chunks than do adult dyads. The mean number of exchanges per chunk is significantly greater for adults than for children in Task I and greater, though not significantly so, in Tasks II and III. Both groups, however, seem to respond to the different tasks by adjusting the

length of the chunk in a similar way, e.g., both child and adult dyads tend to produce longer chunks in Task II than in Task III.

TABLE 4

Means and Standard Deviations of Number of Events per Chunk for Child and Adult Dyads

Task	Child[a]	Adult (N=24)	Significance of Child-Adult Difference[b]
Task I	M 2.68 SD .81	M 3.38 SD .96	$p < .001$ n.s.
Task II	M 6.48 SD 3.98	M 6.90 SD 2.52	n.s. $p < .05$
Task III	M 5.22 SD 2.90	M 5.45 SD 1.79	n.s. $p < .01$

[a] N=47 (Task I), 45 (Task II), 47 (Task III).

[b] F ratios were used to test differences between variances, and Hayes' (1963) t test procedure was used to test differences between means based on samples of unequal size and nonhomogeneous variances.

Differences in Chunk Organization

Examination of the transcripts reveals certain differences in the organization of the chunks in child and adult communications. In this section we will attempt to account for some of these perceived differences by comparing child and adult chunks in respect to the two structural features of chunk beginnings and endings.

Chunk boundary points are frequently marked at the beginning by signals such as all right, okay, now then, and at the end by signals of reception and/or evaluation. Also the chunk boundary is marked by the absence of the structural relationships which usually occur within exchanges. In other words, if a simple event begins a new chunk, its relationship to the previous event is always coded 0. The chunk is, however, a unit of content and the organization of the chunk can best be described in reference to that content. For example, a new chunk can be introduced solely by the presentation of a new theme; the usually occurring markers (okay, all right) are not necessary beginnings. We postulate that participants in a convergent communication act cooperatively to establish the theme, maintain the theme and resolve or terminate the theme of a chunk, and that the chunk is internally differentiated according to these thematic functions. It will be useful to present an example of a maximally developed chunk to illustrate how these functions are realized. Figure 1 is taken from a transcript of an adult male dyad (Task II).

Figure 1

Doer	Knower
	9) okay--now look at your black ball#
10) yeah#	
	11) there's a hole coming out of it on the top?#
12) yup#	
	13) put a long white stick with a black ball on top of it#
14) a long stick#	
	15) yeah/
16) with--with what on top?#	
	17) a black ball#
18) okay#	
	19) if you can find a stick not quite as long as the stick connecting the black and blue#
20) oh oh--is there a middle way stick?# you mean a small stick or a long stick?#	
	21) it's a long stick#
22) okay#	
	23) but it seems like it's not as long#
24) oh well--I don't know what to do about that okay#	
	25) okay you have the black ball there--okay now are there two holes on top of your black ball?#

Coding

		//										
9.	P	9	T	14.	E	9	M	19.	P	10	T	
10.	E	0	M	15.	E	10	M	20.	SE	1	TM_2	embedded exchange sequence
11.	P	4	T	16.	E	6	M	21.	PE	9	TM_2	
12.	E	0	M	17.	E	9	M	22.	E	0	M	
13.	P	9	T	18.	E	0	M	23.	PE	9	TM_2	
								24.	E	$0_{//}$	M_1	
								25.	P		T	

Figure 1. Maximally developed chunk (Task II. Adult Dyad). The symbols and coding procedures are defined in Appendix A of Garvey & Baldwin (1970).

The theme of the chunk can be paraphrased as "putting a long stick with a black ball on it into the top hole of a black ball." The chunk beginning at event 9 is marked with a signal (okay). The locus or precondition to the establishment of the theme is presented first (exchanges 9-10, 10-11, 11-12). The first precondition (black ball) in event 9 is represented by a substitute (it) in event 11. The statement of the theme proper follows (event 13). A series of exchanges (14-15, 15-16, 16-17, 17-18) then maintains and clarifies the components of the theme (stick, black ball). Conditions exist for the termination of the theme (high density of evaluation and low density of new information). However, an embedded exchange sequence extends the chunk. Exchanges 19-20, 20-21, 21-22, 22-23, 23-24 form the embedded exchange sequence. The presence of this unit whose function is to enlarge upon one aspect of the chunk theme (length of stick) does not change the paraphrase of the chunk theme, and an exchange relationship exists between event 18 and the first half of the complex event 25. Other features which are characteristic of adult chunks are also present. These are: (1) a high proportion of events showing Evaluation and/or Reception behavior (E); and (2) a high proportion of events with metacommunication content (M_2) and content composed of continuatives, repetitions or other signals of message reception (M).

Figure 2 represents a complete subtask of Task I of an adult male dyad.

Figure 2

Doer	Knower
1) this one looks like a bug#	
3) a beetle--yeah a beetle#	
	2) mean a beetle--right?#
	4) and it has--does it have--well--mine has unh--red dots#
5) red dots#	
	6) four red dots#
7) four red dots#	
	8) two on each side of--of his--body#
9) all right#	
	10) right#
11) unh--how about the antennas--are they--s--/	
	12) straight# one line#
13) one--line?#	
	14) unh huh# and unh--it has a black stripe--in the middle# U/
15) yeah--the antennas you don't--you don't--you have two antennas right?#	
	16) yeah#
17) are they thin or/	
	18) yeah they/
19) kinda rough--ough up--roughed up#	
	20) unh--no they're thin# thin straight lines--I guess you would say#
21) are the legs real--how many leg have you got?#	
	22) I got eight legs#
23) eight legs#	
	24) okay# and the--and the two--uppermost legs--the ones near his head--are unh--they're bent out on an angle#
25) yeah# okay#	

Coding

Orientation Stage	1.	P	10	G_1	10.	E	0//M		20.	P	0//TM_2
	2.	PE	4	G_1M_2	11.	S	8	T	21.	S	6 T
	3.	E	0//	G_1M_2	12.	P	10	T	22.	P	9 T
	4.	P	9	T	13.	E	4	M	23.	E	9 M
	5.	E	9	M	14.	P	8	T	24.	P	9//T
	6.	P	9	T	15.	S	4	TM_2	25.		Closing
	7.	E	9	M	16.	P	10(I)	TM_2			
	8.	P	9	TM_2	17.	S	8	T			
	9.	E	0	M_2	18.	X	8	X	exchange group		
					19.	S	1	T			

Figure 2. Complete subtask (Task I. Adult Dyad). The symbols and coding procedures are defined in Appendix A of Garvey & Baldwin (1970).

Exchanges 1-2, 2-3 represent the orientation stage. The chunk beginning with event 4 is unmarked, i.e., only the introduction of the theme (the dimension, dots, the attribute, red) signals chunk beginning. The theme is maintained through exchanges 5-6, 6-7, 7-8 and then resolved (9-10). Chunk boundary occurs between events 10 and 11, at which point the participants shift from Knower's presentation of dimensions to the optimal strategy of Doer's search for the correct attribute. The theme of the chunk (11 through 20) is "are antennas thin lines or roughed up lines?" The theme is established by a type of precondition. In this case the topic, antennas, is presented in a content question and is followed by the comment on the topic, thickness. In the more specific question about thickness, the topic is replaced by a substitute (they). Since the Knower interrupts, it is not possible to tell whether the second question was disjunctive, i.e., "are they straight or roughed up?" or polar, i.e., "are they straight?" The remainder of the chunk is devoted to maintaining the theme, in this case by further specifying the comment. The chunk theme is terminated unilaterally by the Knower (event 20), and no exchange relationship holds between event 20 and event 21. The final chunk is introduced by abrupt introduction of a new theme which can be paraphrased as "number of legs?" It is maintained and then resolved by a final closing. Event 25 is apparently addressed in part to the Knower (yeah#), but perhaps in part to the experimenter as well (okay#), indicating the choice made.

Event 14 provides an example of failure to agree on chunk boundary. The Doer intends to maintain the chunk. The Knower, returning to his earlier strategy, terminates the chunk (exchange 13-14) and attempts to begin another chunk by introducing a new theme (black stripe). He is

unsuccessful, and the Doer succeeds in maintaining the earlier theme (antennas) with the Knower's subsequent full cooperation.

Exchanges 17-18, 18-19 form an exchange group (composed of an interrupted event, the interrupting event and the conclusion of the interrupted event). An exchange structural relationship can then be said to hold between the group (17-18-19) and the next event 20, e.g., (17-18-19)-20 = a disjunctive question satisfied by an appropriate response (coded 1).

We have illustrated, then, the manner in which a new theme may be established. It can, of course, be simply introduced, but in many adult chunks a new theme is frequently marked in some special way. Briefly the manner of marking the beginning of a new theme is:

1. Foregrounding a topic as precondition in an independent construction,

   a. in an interrogative clause, as

      Doer - how are the ears?# are <u>they</u> straight or jagged?#

   b. in a clause fragment, as

      Doer - now for the body# is <u>it</u> sort of egg-shaped?#

2. Preposing a locus as precondition for the theme,

   a. in an independent clause, as

      Knower - okay you're on the street where the truck is#
      Doer - okay#
      Knower - okay take <u>that</u> until you hit the next intersection#

   b. in a prepositional phrase, as

      Knower - now in the hole opposite the flat part#
      Doer - yeah#
      Knower - put a short stick in#

The precondition thus presented is then subject to replacement by a

substitute as in examples 1a, 1b and 2a above, or by zero anaphora as in example 2b, i.e., in (it/the hole).

In order to provide some indication of how adults and children differ in the use of precondition, a subsample composed of eight child and eight adult dyads was randomly selected. The transcripts of their coded subtasks of Tasks I, II and III were examined for use of precondition in establishing the theme in the chunks. The number of dyads who used this marking of chunk theme is presented in Table 5.

TABLE 5

Number of Dyads beginning Chunks with Precondition

Task	Child	Adult
Task I	4	7
Task II	1	7
Task III	6	8

Note.--Each cell represents the number out of a possible eight dyads.

Most adult dyads marked the theme of a chunk by precondition whereas fewer child dyads used this feature. The proportions of chunks thus marked were .16 (Task I), .36 (Task II) and .24 (Task III) for adults and .03, .04 and .15 for children. Since only a small number of dyads was counted, no tests of statistical significance were performed.

The second feature of chunk organization on which we will compare child and adult dyads is the manner in which chunks are terminated or resolved. The characteristics of chunk termination have been discussed; low density of new information, high frequency of signals of message

reception and evaluation. These characteristics form a preferred pattern of chunk ending for adult speakers, the components of which are identified by the coding system. Thus, events with behavioral coding E, structural relationship coding 0 or 9 and content coding M, M_1, M_2, regularly end chunks. This pattern will be called the resolution of the chunk theme, or the resolution segment. In short chunks this segment may be quite brief, for example in Figure 3, example A, two resolution segments consist

Figure 3

Doer	Knower
A.	
1) okay are the spots on your bug red or black?#	
	2) unh--the spots are red#
3) spots are red-- // okay how many legs does your have?#	
	4) eight legs--four to each side#
5) eight legs--four to each side-- // are the antennas bristly or straight?#	
	6) straight#
7) okay# //	
B.	
1) does this picture have red or black dots?#	
	2) unh red dots#
3) okay# // does it have one eye or two?#	
	4) two eyes# //
5) are the antlers full--or like-- not just one straight line but#	
	6) just one straight line#
7) just one straight line?#	
	8) unh huh--there's two of them#
9) okay# // how many legs does it have?#	
	10) unh--eight--four on each side/
11) eight-- // okay it's that one#	

Figure 3. Complete subtask illustrating resolution segments (Task I. Two adult dyads on same subtask). Resolution segments are underlined.

of only the first half of complex events. The segment may also be more extensive, comprised of several events as in example B of the same Figure.

In example A of Figure 3, the theme is acknowledged by repetition in the first and second chunk. In the second example, Figure 3B, the acknowledgement is a simple "okay" in the first and third chunks and repetition on the final chunk.

The third chunk composed of exchanges 5-6, 6-7, 7-8, 8-9 (first half of a complex event) illustrates a well developed resolution segment with terminal checking and low density of new information.

The percentage of chunks terminated by a resolution segment was calculated for all child and adult dyads in each of the three coded tasks. The characteristics of the resolution segments were reflected in the coding system, and these data formed the basis for the analysis. The results of this child-adult comparison are presented in Table 6.

TABLE 6

Means and Standard Deviations of the Percentages of Chunks ending with Resolution Segment

Task	Child[a]	Adult (N=24)	Significance of Child-Adult Difference[b]
Task I	M 13.88 SD 11.38	M 48.27 SD 17.64	$p < .001$ $p < .02$
Task II	M 43.24 SD 33.00	M 75.12 SD 22.67	$p < .001$ $.02 < p < .10$
Task III	M 56.24 SD 25.25	M 80.12 SD 14.57	$p < .001$ $p < .02$

[a] N=47 (Task I), 45 (Task II), 41 (Task III)

[b] F ratios were used to test differences between variances, and Hayes' (1963) t test procedure was used to test differences between means based on samples of unequal size and nonhomogeneous variances.

In each task adults terminate chunks with a resolution segment significantly more often than do the child dyads. The differences across the tasks in mean percentages of chunks increase in parallel fashion for children as well as for adults, Task III eliciting the greatest percentage of such segments. Two of the significant differences between variances should also be noted. There is less consistency among the child dyad's performance than among the adult dyad's performance in the model and map tasks. (The children's performance shows less variance than the adults' in Task I but when compared to the children's mean, children's Task I variance also seems large.)

The results reported in this section concerning the organization of the theme of the chunk are interpreted to mean that adults perform more consistently and provide more overt marking of the information structure (arrangement of thematic material) in problem-solving communication than do children.

Chunk Content

Since there is evidence that child and adult dyads differ in the organization of chunks, it is reasonable to suspect that the type of content in child and adult chunks will differ also. In this section we will examine two features of chunk content, one relating primarily to concurrent feedback, the other to attempts at precision of encoding.

The coding of the content of an event distinguished only two major categories, task relevant and task nonrelevant, or peripheral, content. The former category was interpreted very strictly to refer to content which was directly relevant to the content objective of the task: in Task I, for instance, reference to a dimension or attribute; in Task II, specification of a connecting stick or spring or of the number or color of balls. Task peripheral material was further distinguished as management (M_1), metacommunication (M_2), or continuatives or other content relating

to message reception (M). The category coded (M) includes signals which function primarily as concurrent feedback, i.e., exact or partial repetitions and continuatives. In Figure 4, example A, event 10 is coded as M. Event 37 in example B of the same figure is a continuative, also coded M.

Figure 4

Doer	Knower
A.	
8) does it have a crown or a tam?# (task relevant: T)	
	9) a tam# (task relevant: T)
10) has on a tam# okay# (task peripheral: M)	
B.	
	36) and stick a short peg--on top of the red ball# (task relevant: T)
37) all right# (task peripheral: M)	
	38) and put a yellow ball on it# (task relevant: T)

Figure 4. Examples of events with content coding M and T (A - Task I; B - Task II. Adult Dyads).

Chunks in child and adult transcripts from the three tasks were compared on the amount of concurrent feedback used per chunk as measured by the mean number of events in each chunk coded M. Table 7 represents the incidence of M events per chunk for child and adult dyads.

In each task the chunks in adult speech contained a higher incidence of events coded M. Thus, concurrent feedback as measured by M events is a more frequent feature of adult chunks than of children's chunks. It may be noted, however, that child and adult dyads respond in parallel fashion to the demands of the different tasks, both groups producing

comparatively less concurrent feedback in Task I and comparatively more in Task II. The child-adult differences in variability are not as pronounced for this feature as for the previous measures of chunk organization. The differences among the children in using concurrent feedback are not significantly greater than the differences observed among the adults. The adult variance is larger in Task I, but given the small occurrence of M events in the children's Task I performance, the small variance is not surprising.

TABLE 7

Means and Standard Deviations of Number of M Events in Child and Adult Chunks

Task	Child[a]	Adult (N=24)	Significance of Child-Adult Difference[b]
Task I	M .07 SD .09	M .27 SD .18	$p < .05$ $p < .02$
Task II	M .88 SD .70	M 1.31 SD .57	$p < .01$ n.s.
Task III	M .57 SD .43	M .95 SD .48	$p < .01$ n.s.

[a]N=47 (Task I), 45 (Task II), 47 (Task III).

[b]Differences between SD's were tested with F ratios; differences between M's with t tests. The special procedure recommended by Hayes (1963) was used for Task I M's.

Another feature of content was examined. This feature can be labeled functionally as "attempts at precision in encoding." The content code M_2 (metacommunication) was assigned to events which referred to the encoding process itself. Such events included questions of definition or recodings, or paraphrases of some preceding, task relevant event, either on request or voluntarily. An event could be primarily metacommunicative,

or could exhibit both task relevant and metacommunication content. In the former case, the event would be coded M_2, in the latter case, TM_2. M_2 was also used to code an event which, empty of other content, was an assent to, or acknowledgement of, a metacommunication event.

Figure 5

Doer	Knower
A.	
9) what do you mean bushy?# (M_2)	8) the tail is bushy# (T) 10) well not bushy--how about feathery?# (M_2)
B.	
4) two red--four red dots altogether on the back?# (T) 6) divided by a line that looks like a time--a time--you know a time piece with sand?# (TM_2)	5) right--it's/ (uncodable: X) 7) oh--an hour glass--yeah# (M_2)

Figure 5. Examples of events with metacommunication M_2 or TM_2 (A - Task I; B - Task II. Adult Dyads).

Events coded TM_2 or M_2 thus represent an attempt to define terms, distinguish or characterize referents more adequately, and in general, arrive at a mutually satisfactory use of language.

As in the preceding examination of concurrent feedback, chunks in child and adult transcripts were compared on the mean number of TM_2 and M_2 events per chunk. The results are presented in Table 8.

In Tasks I and II chunks in adult speech contain more events devoted to or including metacommunication. In Task III adult and child chunks

are not significantly different in this respect, although the difference is in the expected direction. Although the adult variance is larger than the children's in the first two tasks, the children's variance is large considering the low mean frequency of the occurrence of this feature in the child chunks. The child variance is significantly larger than the adult in Task III.

TABLE 8

Means and Standard Deviations of Number of TM_2-M_2 Events in Child and Adult Chunks

Task	Child[a]	Adult (N=24)	Significance of Child-Adult Difference[b]
Task I	M .14 SD .16	M .55 SD .32	$p < .001$ $p < .02$
Task II	M .26 SD .35	M .79 SD .62	$p < .001$ $p < .02$
Task III	M . 53 SD .67	M .60 SD .45	n.s. $.02 < p < .10$

[a] N=47 (Task I), 44 (Task II), 41 (Task III).

[b] F ratios were used to test differences between variances, and Hayes' (1963) t test procedure was used to test differences between means based on samples of unequal size and nonhomogeneous variances.

Questioning and Question Types

Since convergent communication requires that the participants cooperatively exchange information in order to attain a mutually agreed-upon goal, it was postulated that three types of behaviors are essential. Participants must seek and present information, and when the information is presented, they must explicitly evaluate it or overtly acknowledge its receipt. Events are classified as Search (self or other-generated seeking behavior), Presentation (self or other-generated provision of information) and Reception and/or Evaluation (responsive behavior consisting of assessment or acknowledgement of another's message). Of these, search behavior was selected for further examination.

In order to examine search behavior in convergent communication all events which were directly task relevant (T) and which were also coded as search (S) or search and evaluation (SE) were considered. SE is search which, in general, requests further information rather than new information. Therefore, although SE events encode some evaluation (extension, modification) of preceding messages, they also encode active search and thus were combined with S events for this analysis. Of events coded as S or SE, the majority were in interrogative form. (The exceptions were requests for information couched in declarative or imperative form, as in the Doer's event in the following example: Knower - Go up to the trees. Doer - To the left, I guess. (S) Knower - Yes, to the left.) The few exceptions were eliminated from the events considered in the subsequent analysis.

In order to examine the types of questions asked by children and adults as they completed the three different tasks, a feature of the structural relationship coding was used. The structural coding distinguished

disjunctive, polar, and content question-answer exchanges coded 1, 01, 0(1); 4, 04, 0(4); and 6, 06, 0(6) respectively. The further distinction concerning the answers to these question types was not used in this analysis.

Thus, the events which were used in the analysis of search behavior were events with task content (T), search (S) or search and evaluation behavior (SE), and were exchange-initial events containing disjunctive, polar or content type questions.

The questions produced by child and adult dyads were counted in the coded transcripts of each task. A ratio of these questions to total number of exchanges was calculated giving the proportion of questions representing Search to other behaviors (P, PE, E and X, uncodable). Table 9 presents the mean proportion of questions representing Search for the two groups in each task. These means indicate the proportion of the total events on which the distribution of question types was calculated.

TABLE 9

Mean Proportion of Search Questions in Child and Adult Dyads' Performance of Three Tasks

Task	Child	Adult
Task I	.39	.28
Task II	.24	.12
Task III	.17	.90

The child dyads show a greater proportion of events representing Search coded as questions than do adult dyads in each task. This greater

proportion of Search in the form of questions may be in part explained by the fact that all tasks were more difficult for the children than for the adults (c.f., Baldwin & Garvey, 1970). Despite the differences, all three tasks elicited a sufficient sample of questions from both child and adult dyads so that a comparison of question types was possible.

Before presenting the distribution of question types in the three tasks for child and adult dyads, it will be useful to illustrate the types.

A disjunctive question encodes two alternatives and requests the choice of one, e.g., "Are the glasses square shaped or are they rounded?"

A polar question requests a yes or no answer, e.g., "Are the glasses square?" The several subcategories of this question may indicate speaker expectation of a positive or negative answer, e.g., "But he doesn't have a hump, does he?" or "He has a hump on his back, doesn't he?"

A content question requests an answer other than yes or no and usually further specifies the nature of the response, e.g., "How many?" requests that the response provide a quantity, such as "Six" or "Lots." Other examples of content questions are: "Which way does the curl go?" or "What color are the antennas?" or "How about his glasses?"

Search encoded in the three question types was examined in the coded child and adult transcripts. All adult dyads were used, but only a sample of 24 child dyads was used, that is, three dyads were randomly chosen from each of the eight child subgroups (Negro, white; middle SES, low SES; male and female). The results of the analysis are presented in Table 10. The percentage of dyads using a given question type is presented first and directly below this percentage is the proportion of the given question type to total questions for those user dyads.

TABLE 10

Percentage of Dyads Using Question Types and for User Dyads, Proportion of Type to Total Questions

Task	Percentage and Proportion	Disjunctive Question		Polar Question		Content Question	
		Child	Adult	Child	Adult	Child	Adult
Task I	% of Dyads using Question Type	71%	100%	100%	100%	54%	75%
	For User Dyads, Proportion of Type to Total Questions	.16	.36	.81	.52	.15	.17
Task II	% of Dyads using Question Type	54%	13%	96%	100%	79%	58%
	For User Dyads, Proportion of Type to Total Questions	.20	.26	.63	.77	.37	.33
Task III	% of Dyads using Question Type	25%	21%	100%	100%	63%	33%
	For User Dyads, Proportion of Type to Total Questions	.22	.19	.80	.90	.23	.18

Note.--N=24 dyads from each population group (Child and Adult).

Polar questions are used by virtually all child and adult dyads and account for the majority of questions in each task. Only adults performing Task I show a relatively low proportion of polar questions (.52). In general, the use of disjunctive and content questions seems to be heavily influenced by the specific task. Task I elicits more disjunctive than

content questions, while Tasks II and III elicit more content than disjunctive questions.

Within these general task and question type differences there are also differences between child and adult dyads. In the model building (II) and map tracing (III) tasks, more children ask disjunctive and content questions than do adults. It has been previously shown that the tasks were more difficult for the children and that a greater proportion of the child speech consisted of questions. This observed difference in question encoding may be interpreted as another kind of evidence that the children and adults are encountering somewhat different cognitive problems.

The child and adult differences in Task I are in the same direction as those observed in the other two tasks. Here, more adult dyads use disjunctive and content questions than do child dyads. Of particular interest is the different use of disjunctive questions. As previously mentioned, Task I is different from the other two tasks in that it requires the identification of dichotomous attributes. Thus, it proceeds efficiently if the Doer presents the attributes by asking disjunctive questions. The fact that all adult dyads use disjunctive questions and that this type accounts for more than a third of the questions they ask in this task suggests that adults, more than children, used a specialized and efficient search strategy for this task. Generally, the child-adult differences in frequency of question type across the tasks might suggest that specific task requirements had a more specialized effect on the form of adult search behavior than on the children's.

The percentage of child dyads using the various question types is interesting in that it suggests that these logical formulations for seeking information are in the repertoire of most child dyads. For

example, it is apparent that at least 71% of the 24 child dyads produced a disjunctive question, a finding which is unexpected in light of the difficulty that understanding the simpler logical operation of union (A or B) has been shown to present to children, even those in the eighth grade (Neimark & Slotnick, 1970). While these data cannot be used to determine how cognitive and task differences interact to affect information search, they do suggest that the formulation of questions could be used to explore the phenomena.

Discussion

In order to explore the hypothesized difference in the communication behavior of adults and children, child and adult dyads were observed performing three tasks which elicited convergent communication. The observed communications were compared on several structural features: (1) the presence of a clearly marked opening and closing stage of the communication, (2) the differentiation of the communication into thematic units, called chunks and (3) the organization of the material included in chunks.

In the first comparisons it was observed that adult dyads initiated their communications with an overtly marked orientation stage and concluded their communications with an overtly marked closing stage significantly more often than did child dyads. Thus, as expected, there was greater evidence of consistently occurring stages in the adult performance of the three tasks than in the children's.

The second feature of the communications which was used to contrast child and adult performance was the differentiation of the communication into thematic units, defined as chunks. Since chunks could be identified

in both child and adult communications, the first question concerned the number of chunks used by dyads to complete a task or a standard portion of a task. In four subtasks of Task I, the children and adult dyads were not significantly different in this respect. Both groups used approximately six chunks to complete a subtask. In the map tracing task, however, the children apparently tended to use fewer chunks than adults to complete a standard portion of the task. This difference in mean number of chunks was qualified, however, by the fact that there were large differences among the child dyads in the number of chunks used, i.e., the variance of the numbers was significantly larger for children than for adults. Therefore, the child mean may be less representative than the adult mean of a "typical" dyad performance. The child and adult length of chunks was compared by examining differences in the mean number of communication events included in the chunks of the communications. Again, there were not large, systematic differences between the children and adults. Adults tended to include more events in chunks, but this difference was small and only reached statistical significance in the first task. The variability in the child dyad performance, however, was again noteworthy. In the second and third tasks there were large differences among the child dyads with respect to the mean number of events comprising a chunk. Our general conclusion is that adults do not differ greatly in the number of chunks used in carrying out a task nor in the number of events comprising a chunk. Qualitative differences between adult and child chunks, however, were revealed in the analysis of chunk internal structure and content.

The third structural feature used to compare adult and child communications concerned the internal structure of the chunk. The chunks from the communications of a sample of the dyads were analyzed for the presence

of precondition, a preliminary segment used in establishing the theme. Nearly all of the adult dyads began chunks with precondition in all three tasks while the child dyads were much less consistent in their use of it. Chunks from the communications of all dyads were included in an analysis of the terminal, or resolution segments, which were used to resolve the chunk themes. Again the adult dyads included this structural segment in chunks more often than did child dyads. Another characteristic of the child dyad's performance, however, was large variability, i.e., there were large differences among the child dyads in their use of the resolution segment. In addition to the structural differences observed in child and adult chunks, there were also differences observed in chunk content. Children, on the average, included fewer communication events devoted to providing concurrent feedback or to clarifying and refining their own or a partner's encoding.

In summary, then, we have described the structure of a well-formed convergent communication for adults. Adults rather consistently and redundantly mark openings and closings of entire communications and also explicitly mark aspects of the information structure of each chunk, i.e., the precondition of the theme and the resolution of the theme. Most adults also devote a considerable number of events to explicitly acknowledging and evaluating information and to reworking and refining what has been said.

The features examined appear less frequently in children's communications, and the children, as a group, are less consistent in marking the structure of the communication, in providing feedback and in reworking message form. As a result of the children's variability (and in part, as a result of this comparative approach) we have not directly described the

structure of the children's communications. In general, the picture that emerges for children is one of less intense interaction and of less overt verbal cooperation. Figure 6 provides an example of a complete communication produced by a child dyad. Although we cannot call the example "typical" of children's communications, one feature of this example is characteristic of many child communications. Received information, whether requested or volunteered, is not explicitly acknowledged. Compared to adult communications (see Figures 3 and 4) the interaction process seems quite abbreviated.

In summary, the comparisons suggest that children at this age level have begun to structure problem-solving communications in a manner similar to that of adults but do not yet show the consistent pattern of behavior common to the adults.

A description of children and adult search behavior was also presented using the previously described system for coding the behavior, content and structural relationship between events. The description suggests that adults alter their question-asking strategies to specific task demands more than children do.

As previously described, the sample of fifth-grade children observed performing the communication tasks included eight subgroups (all combinations of the following status characteristics: Negro, white; low SES, middle SES; male, female). Since differences in the use of language have been observed across social classes (in narration by Hess & Shipman, 1965, and in the discussion of certain topics by Hawkins, 1969) it is possible that the variability observed in the children's performance is attributable to consistent but different performances by particular social subgroups of children. Accordingly, each of the features used to

Figure 6

Doer	Knower
1) does he have--does his ears look like--they kinda have a feather on it?#	
	2) no#
3) do he have ears straight?#	
	4) yes#
5) and he has one--eye?#	
	6) no# does he have four legs on each side?#
7) yes#	
	8) does he have--two dots--in one part and two in the other --and a black--a black--like bone--does it divide it?#
9) yeah# is there--the dot red--or black?#	
	10) red# does he have--two little eyes--and lines coming out of his head like a--like ears?#
11) yeah# does his egg shape--I mean--does his body shape like a egg?#	
	12) yes#
13) and does his--legs shape are kinda like--it goes straight out and then--come down?#	
	14) yes#

Coding

1.	S	4	T	6.	S	4	T	11.	S	4	T
2.	P	10(I)	T	7.	P	0//	T	12.	P	0//	T
3.	S	4	T	8.	S	4//	T	13.	S	4	T
4.	P	0//	T	9.	S	1//	T	14.	P	//	T
5.	S	4//	T	10.	S	4//	T				

Figure 6. Complete subtask (Task I. Child Dyad).

examine child-adult differences were also used to examine possible racial, social and sex differences. None of the mean differences in any of the comparisons reached statistical significance. It appears that differences between the subgroups of children in use of the structural features which characterize adult convergent communication were either too subtle to be detected by our analyses or were actually nonexistent. In either case, the differences among children groups are very small compared to the large differences between the children and the adult speakers, and the contention that middle-class children are more like mature speakers than are lower-class children is not supported by these results.

Although the results show large differences between the performance of adults and children, our data do not demonstrate that the conventional procedure employed by most adults is a necessarily more effective means of attaining the specified goal of the communication. For example, some adult dyads completed the tasks successfully without marking an orientation or closing stage. Moreover, in the children's performance there were no significant correlations between any of the structural features and the accuracy of their final solutions. (It should be recalled that in these standardized tasks, the function of the orientation and closing stages may have been subsumed by the experimental instructions and by the presence of the experimenter.)

Despite its lack of direct relationship with attainment of the goal (accurate solutions), the conventional structuring of a communication probably represents a set of expectations governing the interactions of the participants, making it clear where they are in their progress toward the task goal, regulating who must speak next and what his utterance should include.

Future Research

The results of this exploratory work suggest a number of steps for future research. Several steps are required to provide more evidence in support of the basic assumptions underlying the construct of convergent communication. First, in support of this construct, samples of spontaneously elicited conversations conforming to the definition of convergent communication should be collected and analyzed. A few such samples have already been collected: conversations in a computing center in which a researcher (Doer) consults with a programmer or supervisor (Knower) in order to solve a problem in the use of a program (goal). These samples, somewhat more varied and complex than the experimentally elicited transcripts, appear to exhibit the essential organizational features postulated for convergent communication, but the analysis of these samples is not complete and more samples are needed. Second, another, contrasting type of communication should be defined and described. This step is required to demonstrate that the properties of convergent communication are uniquely collocated in that specific type and are not general characteristics of all instances of dyadic communication. Again, a start has been made in the examination of transcripts of interviews, which share much in common with interrogations. We are not as yet able to define this possible conversational type but have noted a distribution of behaviors which differs markedly from that of cooperative problem-solving.

Further work using the same approach described in these three reports could be carried out to explore the effects of other factors in the speech situation on children's speech. For children who have begun to differentiate culturally relevant speaker-addressee relationships, the problem-solving tasks would probably, if performed by mixed child-adult dyads,

elicit different and, perhaps, more consistent behavior. Such an approach might be used in an attempt to distinguish between the child's communication performance and his competence. Care would have to be exercised, however, to avoid confounding differential effects of speaker-addressee relationships with subculturally determined reactions to the new situation, even though no subcultural differences were apparent among the subculturally homogeneous dyads in the present study.

An important step which could be undertaken after the conversation type or types were more firmly and precisely documented would be to sample from several age, grade, or social maturity levels of children to determine when the marking of the organizational units of convergent communication appear and come to approximate the level of adult consistency. If our interpretation of the present results is correct, then we might expect, for example, to see in older children an increase in the frequency and consistency with which messages were acknowledged and evaluated or with which thematic units were resolved.

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